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October 9, 2009

Steve Church
Research Division
California Air Resources Board
1001 I Street
Sacramento, CA 95812

RE: ETAAC Advanced Technology Development Draft Report

Dear Mr. Church:

Thank you for the opportunity to comment on the Economic and Technology Advancement Advisory Committee's draft report on *Advanced Technology Development* dated September 18. I applaud the ETAAC for encouraging the state to take a more active role in furthering the commercialization and deployment of new technologies that will help California meet 2020 GHG goals established under AB 32 as well as its long-term GHG reduction objectives. More specifically, I am writing to urge the Committee to more clearly identify stationary fuel cells as one of the priority technologies that will be required for the state to achieve these goals.

Today in California, more than 25 megawatts of commercial stationary fuel cell product are deployed in a variety of industrial, agricultural and commercial applications. The larger installations include wastewater treatment plants in Santa Barbara and Dublin, a data center in Sunnyvale (Fujitsu), a resort hotel (the Sheraton Hotel & Marina), a brewery (the Sierra Nevada Brewing Co. in Chico), a college campus (Cal State Northridge), and an agricultural processing plant (Gills Onions in Oxnard). Smaller stationary fuel cells provide backup power for cell phone towers and will soon be deployed in residential and specialty vehicle (materials handling) applications in the state. In these applications, fuel cells replace diesel generators and LPG engines.

Electrical efficiencies for stationary fuel cells approach 50 percent and commercial deployments have achieved overall efficiencies exceeding 90 percent in applications utilizing combined cooling, heating and power (CCHP). The high efficiency reduces dependence on fossil fuels and significantly lowers $CO_2$ emissions. The emission of criteria pollutants is virtually zero and the acoustic footprint is remarkably benign. As a result, the technology is well matched for distributed generation and stands as the principal candidate for anchoring next-generation central power production.

Stationary fuel cells represent, without qualification, a renewable source of electricity, cooling, and heat when operated on biogas. A key to this attribute is the provision of renewable electricity, cooling, and heating 24/7 without interruption and without "intermittency." For example, fuel cells operating on digester gas (as is the case at wastewater treatment and food processing plants) is already garnering popularity in the state with over 8MW of product already deployed. The ETAAC report refers to this application, but with a heading ("microbial fuel cells") that alludes to a category of fuel cells, likely to be small in size (e.g., milliwatts), that would operate directly using bacteria as a fuel. I suggest changing the heading to "Renewable Fuel Cells." This section should also appropriately identify the enormous potential for the renewable operation of fuel cells on landfill gas and syngas processed from biogas gasification. Another major attribute of stationary fuel cells in support of a renewable

future, whether operating on natural gas or biogas, is their role in enabling the projected higher penetration of renewable solar and wind resources on the grid. This increased reliance on traditional (i.e., solar and wind) renewable technologies will require enhanced energy storage and the complementary use of 24/7 dispatchable power generation that is (1) clean, and (2) equipped with the dynamic response needed to buffer the intermittency associated with solar and wind power. Fuel cells are well (perhaps uniquely) suited to meet the latter requirement.

An additional section should be added under the heading of "Stationary Fuel Cells." This section should include the operation of stationary fuel cells on natural gas and/or renewable fuels for the local high efficiency and low emissions production of electricity for both grid support (e.g., support of more intermittent renewable power) and support of more electric transportation. Connections between clean and low carbon electricity production and transport can significantly reduce California's carbon footprint. In addition, stationary fuel cells operated on either natural gas or renewable fuels have the special (perhaps unique) feature to co-produce hydrogen for use as a transportation fuel. Such hydrogen co-production can be accomplished at the energy station site for refueling of hydrogen fuel cell vehicles in a manner that significantly contributes to the reduction of greenhouse gas and criteria pollutant emissions.

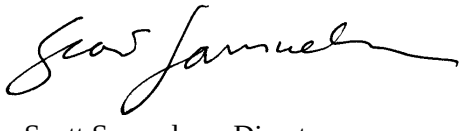
Another suggestion for inclusion in the "Stationary Fuel Cells" section is directed to the monetary value of stationary fuel cells. The ETAAC draft report identifies higher up-front costs and the lack of financial return for "externality" benefits such as lower emission of GHG and other pollutants as one of the most serious market barriers. The National Fuel Cell Research Center (NFCRC) has completed two major reports (posted at www.nfcrc.uci.edu) which, for the first time, monetize the value of large fuel cell systems (molten carbonate, solid oxide, and phosphoric acid, for example) and small fuel cell systems (primarily proton exchange membrane fuel cells). These reports compare fuel cells to other power generation technologies with regard to both criteria pollutants and greenhouse gases. The principal conclusions of the studies are that fuel cells are cost competitive and (1) provide significant value through cogeneration, digester gas use, avoided central station generation, and associated avoided emissions, and (2) can be widely used to significantly reduce greenhouse gas emissions.

Separately, the NFCRC has conducted research under a California Energy Commission grant to identify market and technical barriers to fuel cell commercialization in California. The report has not yet been made public but, in fact, identifies a set of barriers similar to those that the ETAAC has identified to the broader range of technologies included in its draft report.

In ETAAC's words, "The focus of this report is on technologies that have developed to the point where their potential GHG reduction benefits can be assessed, but have not achieved full commercialization." This clearly applies to stationary fuel cells, which are in the early stages of commercialization, experiencing active and accelerating deployment within the state, and are poised for market saturation. For these reasons, I encourage the Committee's consideration to (1) change the title to "Renewable Fuel Cells," (2) add information presented in this letter describing renewable fuel cells, and (3) add a section on "Stationary Fuel Cells" that includes information outlined in this letter regarding the dispatchable 24/7 operation on natural gas, hydrogen co-production, and cost effectiveness features of stationary fuel cells.

Thank you for this opportunity to comment. Please feel free to contact me with questions. I can be reached at (949) 824-5468 or via e-mail at gss@nfcrc.uci.edu.

Sincerely,



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